



ALLEN-BRADLEY

SLC 500™ Family of Small Programmable Controllers

System Overview



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Overview

The SLC 500 family gives you power and flexibility for a complete control solution. Its powerful processor instruction set, advanced programming tools, and expanded product capabilities give you all of the right reasons to use it for your next control application.

The SLC 500 family is a growing family of small programmable controllers built around two hardware options; a fixed controller with an option to expand using a 2-slot chassis, or a modular I/O controller with up to 960 I/O points. The programming tools and most I/O modules are compatible between the two hardware options, so you can cost effectively solve a broad range of applications.

In addition to configuration flexibility, SLC 500 programmable controllers communicate across an embedded DH-485 network allowing program support and monitoring. The SLC 5/03 processor, Catalog Number 1747-L532 provides up to 960 I/O points, online programming, and a keyswitch. Also included in the SLC 5/03 processor is a RS-232 channel that supports asynchronous serial data communication between terminal devices. For implementation of a distributed I/O system, any SLC 500 programmable controller used with the Direct Communications Module (DCM), the Scanner Module (SN), or the Distributed Scanner Module (DSN) integrates into the Allen-Bradley 1771 Remote I/O network.

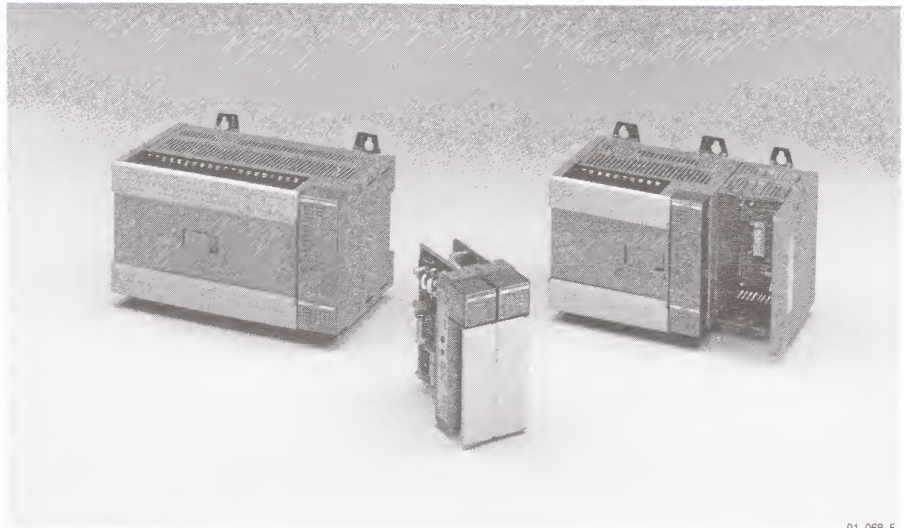
The SLC 500 family offers a variety of discrete I/O modules that enable you to cost-effectively configure your control system. The addition of 32 point I/O modules reduces panel space requirements. All of the discrete I/O modules are UL and CSA certified for industrial applications and the majority are approved for Class I, Division 2 hazardous environments.

New Product Summary

The following table shows the new SLC 500 products and their page references.

Catalog Number	Description	Page Number
1747-L532	SLC 5/03 Processor	6
1746-ITB16	SLC 500 Discrete I/O Module	10
1746-ITV16	SLC 500 Discrete I/O Module	10
1746-OBP16	SLC 500 Discrete I/O Module	11
1746-NT4	Thermocouple/mV Input Module	15
1747-ASB	Remote I/O Adapter Module	20
1747-KE	DH-485/RS-232C Interface Module	24





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SLC 500 Fixed Controller

The SLC 500 Fixed Controller offers a variety of low cost options with up to 104 Input/Output (I/O) points. This controller also offers enhanced networking capabilities and global power supply options. For more information concerning compatibility options, refer to page 36.

The SLC 500 fixed controller includes:

- a central processor unit (CPU) with DH-485 communication connectivity
- a built-in power supply
- a predefined number of I/O points

Feature

Benefits

Three configuration options

20, 30, or 40 I/O with 24 different I/O configurations.

Program memory

1K Instruction or 4K Data Word capacity of RAM.

Optional two-slot expansion chassis

Provides up to 64 additional points of I/O or an interface to specialty I/O modules.

Optional back-up memory

EEPROM or UV PROM memory available.

200mA of 24 VDC user power

Eliminates the need for an external power supply when using sensors.

One high-speed DC input and counter

Selectable 8kHz counter or normal DC input.

Average packaged shipping weights for the fixed controller are:

- 1747-L20 2.40 Kg (5 lb 6 ozs)
- 1747-L30 2.80 Kg (6 lb 4 ozs)
- 1747-L40 3.08 Kg (6 lb 14 ozs)

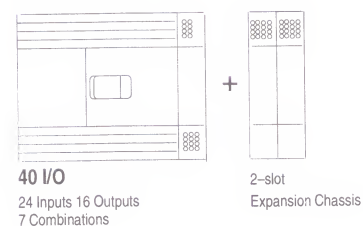
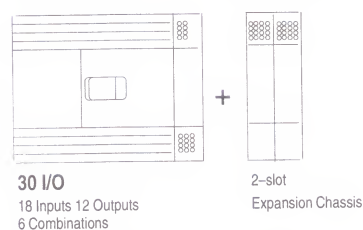
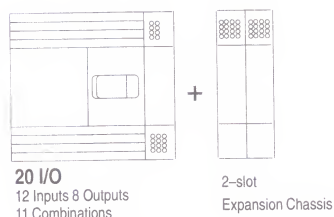
Specifications

The following table provides general specifications for the fixed controller.

Description	Specification
Program Memory	1K Instruction
Standard RAM	Capacitor – 2 weeks ^① Lithium Battery – 5 years ^②
Memory Back-up Options	EEPROM or UVPROM
Typical Scan Time	8 ms/K
Hold-up Time (Load Dependent)	20 ms to 700 ms
LED Indicators	RUN, CPU FAULT, FORCED I/O, BATTERY LOW
Programming	APS or HHT
Power Requirement (max.)	50 VA
Noise Immunity	NEMA Standard ICS 2-230
Fuse Protection 120/240 VAC 24 VDC	1.25A 1.6A
Environmental conditions Operating temperature Storage temperature Humidity rating	0 to +60° C (+32° to +140° F) –40° to +85° C (–40° to +185° F) 5 to 95% (non-condensing)
Wire Size	#24 AWG to #14 (max.)
Communication	DH-485 receive
Certification	UL listed, CSA approved

^① 1747–L511 only – The capacitor back-up is rated at 35° C (95° F).

^② Lithium battery is optional for the L511; standard for the L514.



All fixed controllers accept an optional 2-slot expansion chassis that provides up to 32 additional I/O points.

The following tables provide configuration options for 20, 30, or 40 I/O points. To aid you in configuring your system with additional modules, refer to the Fixed Expansion Chassis Compatibility chart on page 36.

20 I/O Configuration

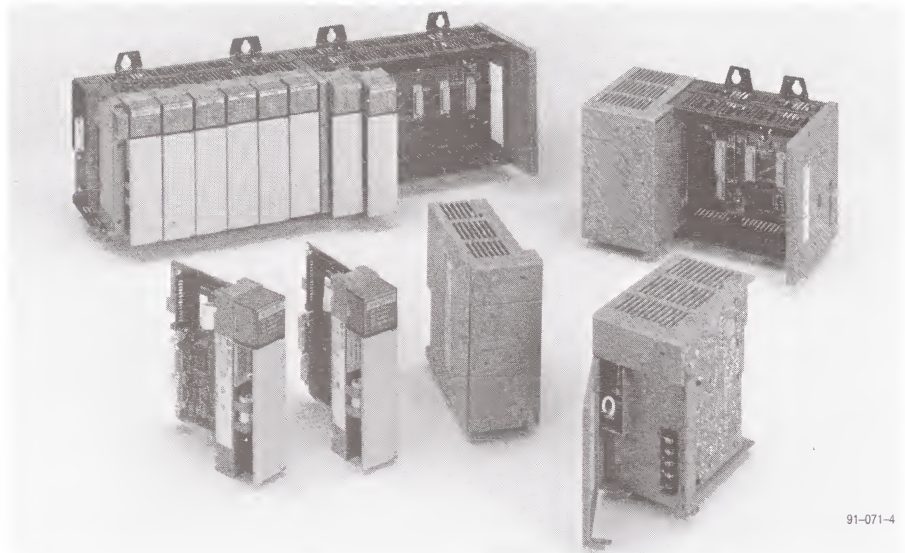
Catalog Number	Input	Output	Input Type	Output Type	Power Supply	High-Speed Counter	User Power
1747-L20A	12	8	120 VAC	Relay	120/240 VAC	No	–
1747-L20B				Triac	120/240 VAC	No	–
1747-L20C			24 VDC Sinking	Relay	120/240 VAC	Yes	24V–200mA
1747-L20D				Triac	120/240 VAC	Yes	24V–200mA
1747-L20E				Transistor Source	120/240 VAC	Yes	24V–200mA
1747-L20F				Relay	24 VDC	Yes	–
1747-L20G				Transistor Source	24 VDC	Yes	–
1747-L20L			24 VDC Sourcing	Transistor Sink	120/240 VAC	Yes	24V–200mA
1747-L20N				Transistor Sink	24 VDC	Yes	–
1747-L20P			240 VAC	Triac	120/240 VAC	No	–
1747-L20R				Relay	120/240 VAC	No	–

30 I/O Configuration

Catalog Number	Input	Output	Input Type	Output Type	Power Supply	High-Speed Counter	User Power
1747-L30A	18	12	120 VAC	Relay	120/240 VAC	No	–
1747-L30B				Triac	120/240 VAC	No	–
1747-L30C			24 VDC Sinking	Relay	120/240 VAC	Yes	24V–200mA
1747-L30D				Triac	120/240 VAC	Yes	24V–200mA
1747-L30L			24 VDC Sourcing	Transistor Sink	120/240 VAC	Yes	24V–200mA
1747-L30P			240 VAC	Triac	120/240 VAC	No	–

40 I/O Configuration

Catalog Number	Input	Output	Input Type	Output Type	Power Supply	High-Speed Counter	User Power
1747-L40A	24	16	120 VAC	Relay	120/240 VAC	No	–
1747-L40B				Triac	120/240 VAC	No	–
1747-L40C			24 VDC Sinking	Relay	120/240 VAC	Yes	24V–200mA
1747-L40E				Transistor Source	120/240 VAC	Yes	24V–200mA
1747-L40F				Relay	24 VDC	Yes	–
1747-L40L			24 VDC Sourcing	Transistor Sink	120/240 VAC	Yes	24V–200mA
1747-L40P			240 VAC	Triac	120/240 VAC	No	–



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SLC 500 Modular Controller

The SLC 500 Modular Controller offers additional flexibility in system configuration, more processing power, and I/O capacity. By selecting the appropriate modular chassis, power supply, processor, and discrete or specialty I/O modules, you can create a controller system specifically designed for your application. Processor options include:

- SLC 5/01 – 1K or 4K instructions processor (Catalog Number 1747-L511 or 1747-L514) with an instruction set identical to the SLC 500 fixed processor
- SLC 5/02 – 4K processor (Catalog Number 1747-L524) with an enhanced instruction set
- SLC 5/03 – 12K words and 4K additional data storage processor (Catalog Number 1747-L532) with an instruction set similar to the SLC 5/02 processor

The instruction set is available on page 39 for your reference.

Feature

Four central processing units

Four different chassis sizes
(4, 7, 10, and 13)

Variety of 1746 I/O modules

Three power supplies

Variety of communication options

Certification

Benefits

Supports a variety of I/O requirements and functionality.

Provides I/O mounting flexibility and expansion options.

Provides over 44 different modules to meet your application needs.

Supports AC and DC power, providing three different sizes.

Support of DH-485, RS-232, and DH+ communication.

UL listed, CSA approved
Class I, Division 2 hazardous
environment (exceptions indicated).

The following table describes the general specifications for the SLC 5/01 (Catalog Number 1747-L511 and 1747-L514), the SLC 5/02, Series C (Catalog Number 1747-L524), and the SLC 5/03 (Catalog Number 1747-L532) processor.

Specification	SLC 5/01 (1747-L511, -L514)	SLC 5/02 (1747-L524)	SLC 5/03 (1747-L532)
Program Memory	1K or 4K Instructions	4K Instructions	12K Words
Additional Data Storage	0	0	up to 4K Words
I/O Capacity	256 Discrete	480 Discrete	960 Discrete
Max. Chassis/ I/O Slots	3/30	3/30	3/30
Standard RAM	Capacitor – 2 weeks ^① Lithium Battery – 2 years ^②	Lithium Battery – 2 years	Lithium Battery – 2 years
Memory Back-up Options	EEPROM or UVPROM	EEPROM or UVPROM	“EEPROM” or “UVPROM” functionality ^④
LED Indicators	RUN, FAULT, FORCED I/O, BATTERY LOW	RUN, FAULT, FORCED I/O, BATTERY LOW, COMM.	RUN, FAULT, FORCED I/O, BATTERY LOW, DH485, RS232
Programming	APS or HHT	APS or HHT	APS
Processor Instruction Set	52	71	71
Typical Scan Time ^③	8 ms/K	4.8 ms/K	1 ms/K
Bit Execution (XIC)	4 microseconds	2.4 microseconds	.40 microseconds

^① 1747-L511 only – The capacitor back-up is rated at 35°C (95°F).

^② Lithium battery is optional for the L511; standard for the L514.

^③ The scan times are typical for a 1K ladder logic program consisting of simple ladder logic and communication servicing. Actual scan times depend on your program size, instructions used, and the DH-485 communication.

^④ The 1747-M11 Memory Module cannot be erased with UV light. It must be reprogrammed or erased with a PROM Programmer using the Memory Module Adapter (Catalog Number 1747-M15).

Communication Options

The following table summarizes the communication options for the SLC 500 processor family.

Communication	Processor Type		
	SLC 5/01	SLC 5/02	SLC 5/03
DH-485	(responder)	(responder or initiator)	(responder or initiator)
RS-232 (DF1 Full or Half-Duplex Slave on DH-485)	● ^①	● ^①	●
Data Highway Plus	● ^{②③}	● ^{②③}	● ^②

^① A 1747-KE module is required.

^② A 1784-KA5 module is required.

^③ Responder operation only through the 1784-KA5 module.

System Protection Options

The SLC 500 family of processors offer a number of hardware and software security features designed to help you protect your system from unauthorized changes to program or data files. The different types of protection are:

Types of Protection	SLC Fixed, 5/01	SLC 5/02	SLC 5/03
Password	•	•	•
Future Access (OEM Lock)	•	•	•
Program Owner	•	•	•
Program Files	•	•	•
Data Table Files	•	•	•
Memory Module Data File Overwrite			•
Memory Module Program Compare			•
Memory Module Write Protection			•
Force Protection			•
Keyswitch			•
Communication Channel Protection			•

Memory Modules

The following memory modules provide non-volatile memory for the SLC 500 processors.

Catalog Number	SLC 5/01	SLC 5/02	SLC 5/03
1747-M1 1K User Words	•	•	
1747-M2 4K User Words	•	•	
1747-M3 1K User Words	•	•	
1747-M4 4K User Words	•	•	
1747-M11 12K Words			•



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Power Supply Options

Allen-Bradley offers three different power supplies, two AC and one 24 VDC. The AC supplies can be configured to operate using 120 or 240 VAC.

Specification	Catalog Number 1746-P1	Catalog Number 1746-P2	Catalog Number 1746-P3
Line Voltage	85-132/170-265 VAC 47/63 Hz	85-132/170-265 VAC 47/63 Hz	19.2-28.8 VDC
Typical Line Power Requirement	135 VA	180 VA	90 VA
Backplane Current Capacity (derated by 5% at +60° C)	2.0A at 5 VDC 0.46A at 24 VDC	5.0A at 5 VDC 0.96A at 24 VDC	3.6A at 5 VDC 0.87A at 24 VDC
24 VDC User Power Output Current	200mA	200mA	NA
Hold-up Time (Load Dependent)	20 ms to 3000 ms	20 ms to 3000 ms	20 ms to 3000 ms
Fuse Protection	3.0A	3.0A	5.0A
Inrush Current	20.0A (max.)		
Temperature Range	0 to +60° C (+32° to +140° F)		
Wiring	Two #14 AWG wires per terminal (max.)		

1746 Discrete I/O Modules

The 1746 I/O platform is a modular hardware design that uses a cost and space effective means to add I/O modules to your control system. I/O modules are available in a variety of densities including 4, 8, 16, and 32 point and can interface to AC, DC, and TTL voltage levels.

Feature

High density 32-point and combination modules
Removable terminal blocks on 16-point modules
Industrial design

Benefits

Reduces rack size and panel space requirements.
Provides ease of wiring and module replacement.
Provides input filtering and optical isolation for exceptional reliability in industrial applications.

1746 Discrete Input Modules

Voltage Category	Operating Voltage	Number of Inputs	Points Per Common	Catalog Number	Backplane Current Draw		Signal Delay (ms. max)	Off-State Current (max.)
					5 V	24 V		
100/120 VAC	85–132	4	4	1746-IA4	0.035	0	on=35 off=45	2mA
	85–132	8	8	1746-IA8	0.050	0	on=35 off=45	2mA
	85–132	16	16	1746-IA16 (RTB)	0.085	0	on=35 off=45	2mA
200/240 VAC	170–265	4	4	1746-IM4	0.035	0	on=35 off=45	2mA
	170–265	8	8	1746-IM8	0.050	0	on=35 off=45	2mA
	170–265	16	16	1746-IM16 (RTB)	0.085	0	on=35 off=45	2mA
24 VAC/DC	10–30 DC sink	16	16	1746-IN16 (RTB)	0.085	0	on=15 DC off=15 DC	1mA AC & DC
	10–30 AC						on=25 AC off=25 AC	
24 VDC	10–30 sink	8	8	1746-IB8	0.050	0	on=8 off=8	1mA
	10–30 sink	16	16	1746-IB16 (RTB)	0.085	0	on=8 off=8	1mA
	18–30 at 50°C 18–26.4 at 60°C sink	32	8	1746-IB32 ^①	0.106	0	on=3 off=3	1mA
	10–30 sink	16 (Fast Response)	16	1746-ITB16 (RTB)	0.085	0	on=0.3 off=0.5	1.5mA
	10–30 source	8	8	1746-IV8	0.050	0	on=8 off=8	1mA
	10–30 source	16	16	1746-IV16 (RTB)	0.085	0	on=8 off=8	1mA
	10–30 source	16 (Fast Response)	16	1746-ITV16 (RTB)	0.085	0	on=0.3 off=0.5	1.5mA
	18–30 at 50°C 18–26.4 at 60°C source	32	8	1746-IV32 ^①	0.106	0	on=3 off=3	1mA
5	TTL	16	16	1746-IG16 (RTB)	0.140	0	on=.25 off=.50	4.1mA

^① Not certified for Class I, Division 2 hazardous location.

RTB = Removable Terminal Block.

1746 Discrete Output Modules

Voltage Category	Operating Voltage	Number of Outputs	Points Per Common	Catalog Number	Backplane Current Draw		Signal Delay (ms. max)	Off State Leakage (max.)	Load Current at 5 VDC (min.)	Continuous Current per Point (max.)	Continuous Current per Module (max.)
					5 V	24 V					
120/240 VAC	85–265	8	4	1746–OA8	0.185	0	on=0.10 off=11.0	2mA	10mA	1A at 30° C 0.50A at 60° C	8A at 30° C 4A at 60° C
	85–265	16	8	1746–OA16 (RTB)	0.370	0	on=0.10 off=11.0	2mA	10mA	0.50A at 30° C 0.25A at 60° C	8A at 30° C 4A at 60° C
24 VDC	10–50 source	8	8	1746–OB8	0.135	0	on=0.10 off=1.0	1mA	1mA	1A at 30° C 0.50A at 60° C	8A at 30° C 4A at 60° C
	10–50 source	16	16	1746–OB16 (RTB)	0.280	0	on=0.10 off=1.0	1mA	1mA	0.50A at 30° C 0.25A at 60° C	8A at 30° C 4A at 60° C
	20.4–26.4 source	16	16	1746OBP16 ^{①②} (RTB)	0.250	0	on=0.10 off=1.0	1mA	1mA	1.5A at 30° C 1.0A at 60° C	6.4A at 0° to 60° C
	5–50 source	32	16	1746–OB32 ^①	0.452	0	on=0.10 off=1.0	1mA	1mA	0.1A at 60° C	3.2A at 60° C
	10–50 sink	8	8	1746–OV8	0.135	0	on=0.10 off=1.0	1mA	1mA	1A at 30° C 0.50A at 60° C	8A at 30° C 4A at 60° C
	10–50 sink	16	16	1746–OV16 (RTB)	0.270	0	on=0.10 off=1.0	1mA	1mA	0.50A at 30° C 0.25A at 60° C	8A at 30° C 4A at 60° C
	5–50 sink	32	16	1746–OV32 ^①	0.452	0	on=0.10 off=1.0	1mA	1mA	0.1A at 60° C	3.2A at 60° C
5 TTL	4.5–5.5 sink	16	16	1746–OG16 (RTB)	0.180	0	on=0.25 off=0.50	0.10mA	0.15mA	0.024A	NA
VAC/VDC Relay	5–265 VAC 5–125 VDC	4	4	1746–OW4 ^①	0.045	0.045	on=10.0 off=10.0	0mA	10mA	see relay chart	8.0A 8.0A/common
	5–265 VAC 5–125 VDC	8	4	1746–OW8 ^①	0.085	0.090	on=10.0 off=10.0	0mA	10mA	see relay chart	16.0A 8.0A/common
	5–265 VAC 5–125 VDC	16	8	1746–OW16 ^① (RTB)	0.170	0.180	on=10.0 off=10.0	0mA	10mA	see relay chart	16.0A 8.0A/common
	5–265 VAC 5–125 VDC	8	individually isolated	1746–OX8 ^① (RTB)	0.085	0.090	on=10.0 off=10.0	0mA	0mA	see relay chart	see ^③

① Not certified for Class I, Division 2 hazardous location.

② A fused common and blown fuse LED are provided on this module.

③ The continuous current per module must be limited to 1440 VA (max.).

Relay Contact Rating Chart

Type	Maximum Volts	Amperes ^①		Amperes Continuous ^③	Voltamperes	
		Make	Break		Make	Break
Relay Contact Ratings for OW4, OW8, and OW16	240 VAC 120 VAC	7.5A 15.0A	0.75A 1.50A	2.5A	1800 VA	180 VA
	125 VDC	0.22A ^②		1.0A	28 VA	
	24 VDC	1.2A ^②		2.0A	28 VA	

Type	Maximum Volts	Amperes		Amperes Continuous ^③	Voltamperes	
		Make	Break		Make	Break
Relay Contact Ratings for OX8	240 VAC 120 VAC	15.0A 30.0A	1.5A 3.0A	5.0A	3600 VA	360 VA
	125 VDC	0.22A ^②		1.0A	28 VA	
	24 VDC	1.2A ^②		2.0A	28 VA	

① Connecting surge suppressors across your external load will extend the life of SLC 500 relay contacts. For recommended surge suppressors when switching AC inductive loads, consult the SLC 500 Installation and Operation User Manual (Catalog Number 1747–NI002). Recommended surge suppression for switching 24 VDC inductive loads is a 1N4004 diode that is reverse wired across the load.

② For DC voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28 VA by the applied DC voltage. For example, 28 VA/48 VDC = 0.58A.

For DC voltage applications less than 48V, the make/break ratings for relay contacts cannot exceed 2A.

For DC voltage applications greater than 48V, the make/break ratings for relay contacts cannot exceed 1A.

③ The continuous current per module must be limited so the module power does not exceed 1440 VA.

1746 Discrete Combination Modules

Voltage Category	Operating Voltage	Points Per Module	Points Per Common	Catalog Number	Backplane Current Draw		Specification Reference
					5 V	24 V	
Inputs-120 VAC	85-132 VAC	2 inputs 2 outputs	2	1746-IO4 ^①	0.030	0.025	See specifications for Catalog Numbers 1746-IA4 and 1746-OW4 Continuous Current for IO4 is 4.0A Continuous Current for IO8 is 8.0A
Relay Outputs 100/120 VAC	5-265 VAC 5-125 VDC	4 inputs 4 outputs	4	1746-IO8 ^①	0.060	0.045	
		6 inputs 6 outputs	6	1746-IO12 ^①	0.090	0.07	See specifications for Catalog Numbers 1746-IA16 and OW16 Continuous Current for IO12 is 8.0A

^① Not certified for Class I, Division 2 hazardous location.

Specifications

Description	Specification
Noise Immunity	NEMA Standard ICS 2-230
Vibration (operating)	Displacement – .015 inch peak to peak at 5 – 57 Hz
	Acceleration – 2.5 Gs at 57 – 2000 Hz
Shock (operating)	30 Gs
Isolation	1500 V
Environmental conditions	
Operating temperature	0 to +60° C (+32° to +140° F)
Storage temperature	–40° to +85° C (–40° to +185° F)
Humidity rating	5 to 95% (non-condensing)
Certification	UL listed, CSA approved
Hazardous Environment Classification	Class I, Division 2 Hazardous Environment ^①

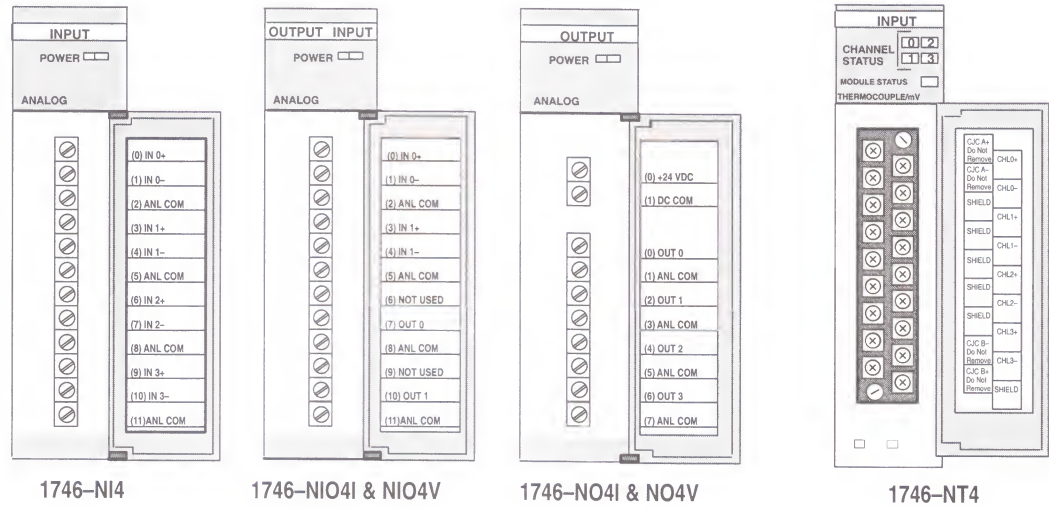
^① Some modules are excluded from this certification. Refer to the previous tables for a complete listing.

Bulletin 1492 Interface Modules and Cables

Allen-Bradley's new wiring system for programmable controllers reduces installation time and increases start-up success. Comprised of a Bulletin 1492 Interface Module and a pre-wired cable, this wiring system can eliminate up to 50 percent of the point-to-point wiring between the programmable controller and field devices. Available for many of the SLC 500 and PLC 16- and 32-point I/O modules, the wiring system provides a lower probability for wiring errors. Optional LEDs on the Interface Module indicate the on/off status of input and output devices, aiding in troubleshooting your wiring system. For more information refer to Publication 1492-1.6.

Specialty I/O Modules

The SLC 500 family offers specialty I/O modules that enhance your control system. These modules range from analog, motion control, and communication to provide a unique, easy to use interface between the modules and the processor. The following section provides an overview of our specialty I/O modules.



1746 I/O Analog Modules

The SLC 500 family offers six different I/O analog modules for your control applications.

- NI4 input module
- NIO4I and NIO4V input/output modules
- NO4I and NO4V output modules
- NT4 Thermocouple module

Feature

- High resolution
- Backplane powered
- User selectable inputs
- Input channel filtering
- Image maps directly into the SLC image

Benefit

- 16 bit input and 14 bit output converters provide accurate control capabilities.
- No external power supply required, reducing system cost.
- Configurable per channel for current or voltage inputs.
- Rejects high frequency noise that couples into an analog input signal.
- Saves memory usage and time.

The following table provides individual module specifications.

Catalog Number 1746–	Input Channels per Module	Output Channels per Module	Backplane Current Draw	External 24 VDC Power Supply Tolerance
NI4	4 differential, voltage or current selectable per channel	NA	25mA at 5 VDC 85mA at 24 VDC	NA
NIO4I	2 differential, voltage or current selectable per channel	2 current outputs not individually isolated	55mA at 5 VDC 145mA at 24 VDC	NA
NIO4V	2 differential, voltage or current selectable per channel	2 voltage outputs, not individually isolated	55mA at 5 VDC 115mA at 24 VDC	NA
NO4I	NA	4 current outputs, not individually isolated	55mA at 5 VDC 195mA at 24 VDC	24 ±10% at 195mA (21.6 to 26.4 VDC)
NO4V	NA	4 voltage outputs, not individually isolated	55mA at 5 VDC 145mA at 24 VDC	24 ±10% at 145mA (21.6 to 26.4 VDC)

Important: All analog modules are isolated from each other and from the backplane. If the NO4I or the NO4V is externally powered, the 24 VDC backplane current draw is 0mA.

Specifications

Description	Specification
SLC Communication Format	16 Bit Two's Complement Binary
Field Wiring to Backplane Isolation	500 VDC
Conversion Time	512µs. for all channels in parallel
Current/Voltage Ranges	
NI4	±10 VDC or ±20mA (current and voltage input)
NIO4I	±10 VDC or ±20mA (input)
NIO4V	±10 VDC (output)
NO4I	0 to 21mA (current output)
NO4V	±10 V (voltage output)
Step Response	
Input	60 ms at 95%
Output	2.5 ms at 95%
Maximum Wire Size	#14 AWG
Terminal Block	Removable
Noise Immunity	NEMA Standard ICS 2–230
Environmental Conditions	
Operating temperature	0 to +60° C (+32° to +140° F)
Storage temperature	–40° C to +85° C (–40° to +185° F)
Humidity rating	5 to 95% (non–condensing)
Recommended Cable	Belden #8761
Certification	UL 508 listed, CSA 22.2 142 approved
Hazardous Environment Classification	Class I, Division 2 Hazardous Environment

1746-NT4 Thermocouple/mV Module

The thermocouple/mV module receives and stores digitally converted thermocouple and/or DC millivolt (mV) analog data into its image table for retrieval by all fixed and modular SLC 500 processors.

Feature	Benefit
Cold-junction compensation and linearization	Provides accurate process digital temperature readings.
Four selectable filters	Allows you to tailor system response to your environment.
Individual channel configuration	Allows you to mix millivolt and thermocouple types.

The 1746-NT4 module converts input signals from the following input types.

Thermocouple Temperature Ranges

Type of Thermocouple Input	° C Temperature Range	° F Temperature Range	Accuracy (Max. error at 25° C)
Type J	-210° C to 760° C	-346° F to 1400° F	±1.06° C
Type K	-270° C to 1370° C	-454° F to 2498° F	±1.72° C
Type T	-270° C to 400° C	-454° F to 752° F	±1.43° C
Type E	-270° C to 1000° C	-454° F to 1832° F	±0.72° C
Type N	0° C to 1300° C	32° F to 2372° F	±1.39° C
Type R	0° C to 1768° C	32° F to 3214° F	±3.59° C
Type S	0° C to 1768° C	32° F to 3214° F	±3.61° C
Type B	300° C to 1820° C	572° F to 3308° F	±3.12° C

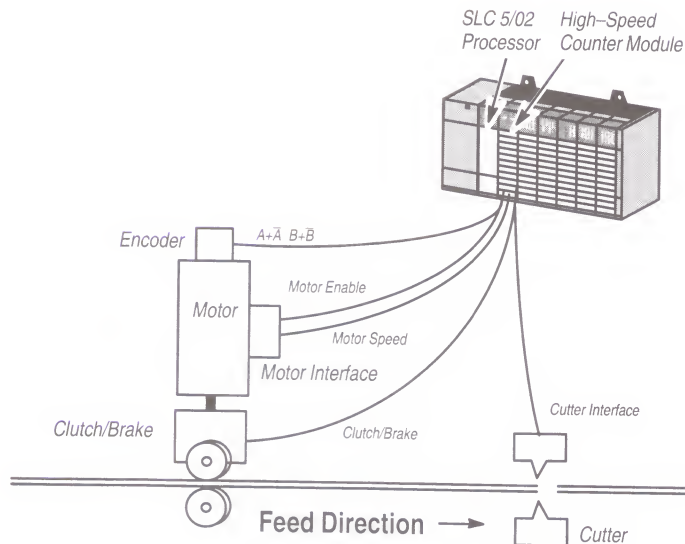
DC Millivolt Input Ranges

Millivolt Input Type	Range	Accuracy (Max. error at 25° C)
± 50 mV	-50 mVDC to +50 mVDC	50µV
± 100 mV	-100 mVDC to +100 mVDC	50µV

Specifications

Specification	Description
Backplane Current Draw 5 VDC 24 VDC	60mA 20mA
Temperature Scale Resolution (selectable)	° C of ° F and 0.1° C or 0.1° F
Millivolt Scale Resolution (selectable)	0.1 millivolt and 0.01 millivolt (mV)
Open Circuit Method	Upscale
Input Step Response	10 Hz at 300 msec 50 Hz at 60 msec 60 Hz at 50 msec 250 Hz at 12 msec
Thermocouple Linearization	IPTS-68 standard, NBS MN-125, NBS MN-161
Maximum Cable Impedance	25 ohms max. loop impedance for <1LSB error
Calibration	Autocalibration at power-up and when a channel is enabled.
Isolation	500 VDC continuous between inputs and chassis ground, and between inputs and backplane.
Recommended Cable for thermocouple inputs for mV inputs	Appropriate shielded thermocouple extension wire ^① Belden #8761 or equivalent (shielded twisted pair)
Maximum Wire Size	Two 14 AWG wires per terminal
Certification	UL 508 listed, CSA 22.2 142 approved
Hazardous Environment Classification	Class I, Division 2 Hazardous Environment

^① Refer to the thermocouple manufacturer for the correct extension wire.



1746-HSCE High-Speed Counter Module

The High-Speed Counter Module provides bidirectional counting of high speed inputs from quadrature encoders and various high-speed switches. This single channel accepts input pulse frequencies of up to 50 kHz, allowing precise control of fast motions. This module is compatible with the SLC 5/02 and SLC 5/03 processor.

In addition to providing an Accumulated Count, the module provides the Rate Measurement indicating the pulse frequency in Hertz (Hz). The Rate Measurement is determined by accumulating input pulses over a fixed period of time. The dynamically configurable Rate Period ranges from 10 milliseconds to 2.55 seconds.

Feature

Three modes of operation
(Range, Rate, and Sequencer)

Four on-board open collector
outputs

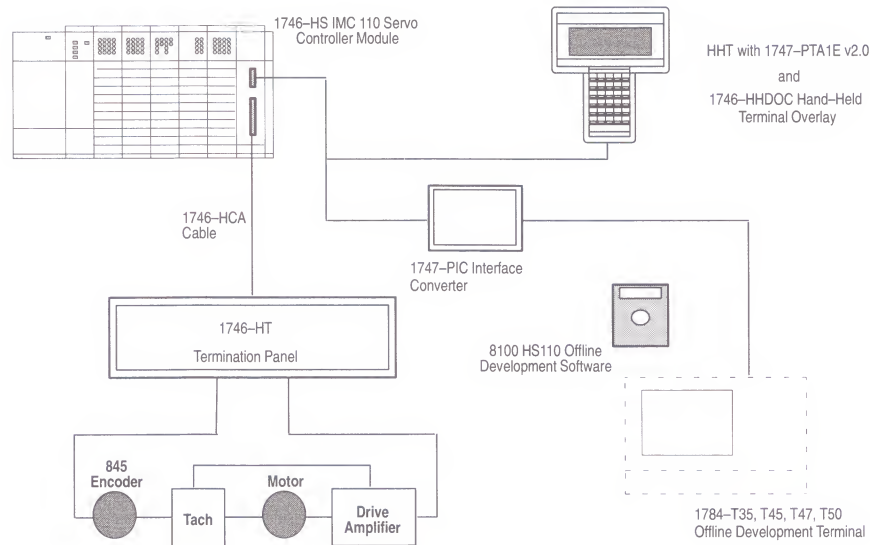
Benefit

Allows you to select the best mode to
fit your application.

Allows control, independent of the
SLC processor scan by the module.

Specifications

Description	Specification
Backplane Current Draw	
5 VDC	320mA
24 VDC	0.0mA
Noise Immunity	NEMA Standard ICS 2-230
Environmental conditions	
Operating temperature	0° to +60° C (+32° to +140° F)
Storage temperature	-40° C to +85° C (-40° F to +185° F)
Humidity rating	5 to 95% (non-condensing)
Max. Input Frequency	
Sequencer and Range	50 kHz
Rate	32.767 kHz



1746-HS IMC™ 110 Servo Positioning Module

The IMC 110 Motion Control System is a single-axis closed loop servo positioning module that plugs into a single slot of the SLC 500 programmable controller. When used with servo drives, motors and encoders, the IMC 110 becomes the key component of a low cost and powerful motion control system. Motion Management Language (MML) and Graphical Motion Control Language (GML) provide two easy-to-use offline programming tools, which aid you in debugging and graphics interface.

The IMC 110 replaces mechanical methods of controlling machine speed and position. The IMC 110 directs the movement of a single axis, or shaft, through a pre-programmed sequencer, while it monitors an encoder for position feedback.

Feature

Four fast I/O points

±10 VDC signal

5 ms Servo Loop Closure Rate

SLC 500 Interface

Termination Panel Interface

Benefit

Controlled by the IMC 110 system, saving valuable throughput time.

Provides an interface to most servo drives.

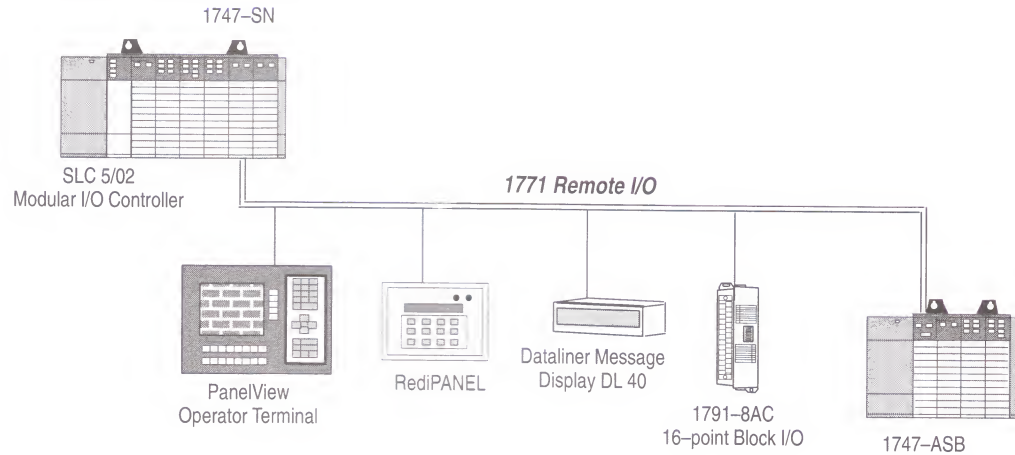
Provides a high degree of accuracy and system response.

Supports either an SLC 500 fixed or modular system.

Provides a wiring connection for fast I/O, E-stop, power supplies, drive command and encoder feedback.

The backplane current draw at 5 VDC is 0.36 Amps and 0 Amps at 24 VDC.

Remote I/O Modules



1747-SN Remote I/O Scanner

The Remote I/O Scanner provides high-speed remote communication between an SLC processor and Allen-Bradley operator interface and control devices. The scanner provides connectivity of your SLC 5/02 or SLC 5/03 processor to devices such as RediPANEL, DL40 Dataliner, PanelView, Block I/O, Allen-Bradley drives, and 1771 I/O devices. Refer to page 23 for a brief description of these products.

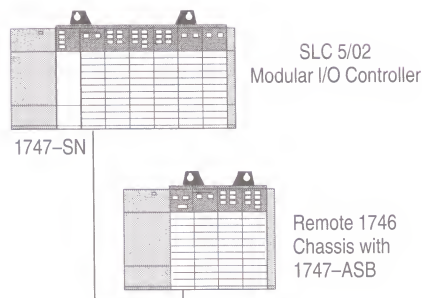
The scanner does not support block transfer operations and cannot be used in a SLC 500 Fixed or SLC 5/01 system. The Remote I/O Scanner features the following:

Feature

- Selectable baud rates (57.6, 115.2, and 230.4 Kbaud)
- RIO link cable length of 3050 m (10,000 ft.) (max.)
- Supports connection of up to 16 physical devices

Benefit

- Provides noise immunity over various cable distances.
- Allows for distribution of devices over a wide physical area.
- Provides a wide range of applications to be addressed.



1747-ASB Remote I/O Adapter Module

The Remote I/O Adapter module is a single-slot, RIO communication link module. It occupies the first slot (slot 0) of a 1746 remote chassis, where the SLC processor normally resides. The ASB module acts as a gateway between an SLC 500 scanner and the I/O modules in the 1747-ASB remote and expansion chassis.

The ASB module is compatible with all Allen-Bradley RIO scanners. The Remote I/O Adapter module features the following:

Feature

Supports 1/2 slot, 1-slot, and 2-slot addressing modes

Monitor three 7-segment displays

Secure I/O and DIP switch configurations

Benefit

Provides efficient image utilization by allowing you to assign the amount of image space required per slot.

Provides status information and troubleshooting.

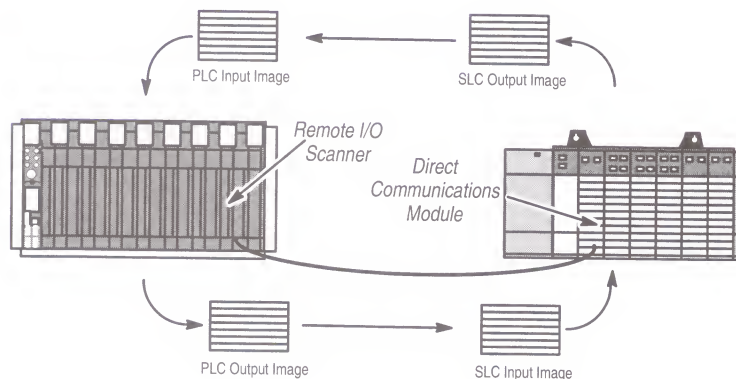
Allows you to inhibit operation if the configuration or DIP switch settings were modified since the last save.

Specifications for 1747-SN and 1747-ASB

Specification	SN	ASB
Backplane Current Draw	900mA at 5 VDC	375mA at 5 VDC
Noise Immunity	NEMA Standard ICS 2-230	NEMA Standard ICS 2-230, IEEE
Compatible Remote I/O Link Cable	Belden 9463	
Extended Node Support	Yes	
Environmental conditions	1747-ASB 0° to +60° C (+32° F to +140° F) 1747-SN 0° to +55° C (+32° F to +131° F)	
Operating temperature	-40° C to +85° C (-40° F to +185° F)	
Storage temperature	5 to 95% (non-condensing)	
Humidity rating	UL listed, CSA approved	
Certification	Class I, Division 2 Hazardous Environment	
Hazardous Environment Classification		

Remote I/O Specifications

Baud Rate	Cable Distance
57.6 Kbaud	3050 m (10,000 ft.)
115.2 Kbaud	1524 m (5,000 ft.)
230.4 Kbaud	762 m (2,500 ft.)



1747-DCM Direct Communications Module

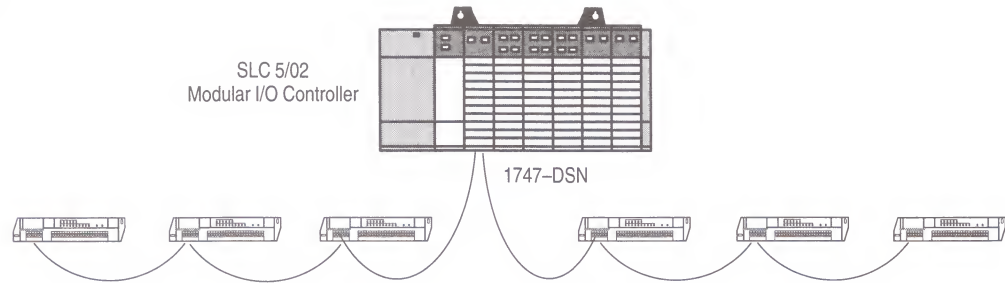
The Direct Communications Module (DCM) links the SLC 500 controller to the Allen-Bradley PLC for distributed processing. The DCM acts as a remote I/O adapter on a remote I/O link. Information is transferred between a local PLC or SLC scanner and a remote 1747-DCM module during each remote I/O scan. The number of DCMs that a scanner can supervise depends on the number of racks the scanner supports and the rack size of the DCM. Each SLC 500 fixed controller with a Catalog Number 1746-A2 expansion rack supports one DCM. The SLC 500 modular controllers can support multiple DCMs.

The DCM can be configured for one of the following:

- 1/4 rack = 2 words (1 remote I/O word and 1 status word)
- 1/2 rack = 4 words (3 remote I/O words and 1 status word)
- 3/4 rack = 6 words (5 remote I/O words and 1 status word)
- full rack = 8 words (7 remote I/O words and 1 status word)

Specifications

Description	Specification
Backplane Current Draw	
5 VDC	0.36A
24 VDC	0.00A
Baud Rate	Maximum Cable Distance
57.6 KBaud	1048 m (10,000 ft.)
115.2 KBaud	1524 m (5,000 ft.)
230.4 KBaud	762 m (2,500 ft.)
Noise Immunity	NEMA Standard ICS 2-230
Environmental conditions	
Operating temperature	0° to +55° C (+32° F to +131° F)
Storage temperature	-40° C to +85° C (-40° F to +185° F)
Humidity rating	5 to 95% (non-condensing)



1747-DSN Distributed I/O Scanner

The Distributed I/O Scanner provides high-speed communication between an SLC 500 processor and Bulletin 1791 Block I/O, Series A only. A Distributed I/O (DIO) System consists of an SLC 5/01, SLC 5/02, or SLC 5/03 processor, a 1747-Distributed I/O scanner, and block I/O. The block I/O cannot exceed 16 inputs/outputs to work with the 1747-DSN module.

The scanner enables the SLC processor to exchange input and output information with up to 7 I/O blocks using an SLC 5/01 processor and up to 30 I/O blocks using a SLC 5/02 or SLC 5/03 processor. The Distributed I/O Scanner provides the following features:

Feature

Locate I/O blocks close to sensors and actuators

Compact size

A word provides the current communication status of each block I/O

Benefit

Reduces wiring costs in remote applications.

Requires a smaller enclosure or the module can be embedded in a protected area of a machine.

Simplified diagnostic reporting.

Specifications

Description	Specification
Backplane Current Draw	900mA at 5 VDC
Noise immunity	NEMA Standard ICS 2-230
Processor type	SLC 5/01 and above
DIO Link Baud Rate	230.4 KBaud
Environmental conditions	
Operating temperature	0° to +55° C (+32° F to +131° F)
Storage temperature	-40° C to +85° C (-40° F to +185° F)
Humidity rating	5 to 95% (non-condensing)
Certification	UL listed, CSA approved
Hazardous Environment Classification	Class I, Division 2 Hazardous Environment

The 1747-DSN Series A module is only compatible with Catalog Number 1791-IOBA and 1791-IOBB Block I/O.

Remote I/O Devices

The following remote I/O devices interface with the SLC 500 remote I/O modules.

1791 Block I/O

Block I/O is a self-contained I/O interface that provides the functionality of the I/O rack, adapter, power supply, and I/O module in a single interface. The block communicates over the Allen-Bradley remote I/O network, joining other Allen-Bradley devices such as operator interface, drives, remote I/O chassis, and vision systems. For additional information refer to Publication 1791-1.3.

2705 RediPANEL Operator Modules

RediPANEL Operator modules combine push buttons, wiring, I/O modules, a message display, and other control panel components in a single pre-packaged, ready-to-install unit. For additional information refer to Publication 2705-1.0.

2706 Dataliner Message Displays

The Dataliner Message Displays provide a cost-effective means of communicating essential machine or process status, alarm conditions, and operator prompts across a machine or a large plant floor. For additional information refer to Publication 2706-1.0.

2711 PanelView Operator Terminals

The PanelView Operator Terminals replace hard-wired control panels with CRT screens that are simple to configure. PanelView terminals provide you with extensive diagnostic information during fault conditions via message windows, alarm windows, and simple graphics. For additional information refer to Publication 2711-1.1.

DRIVES

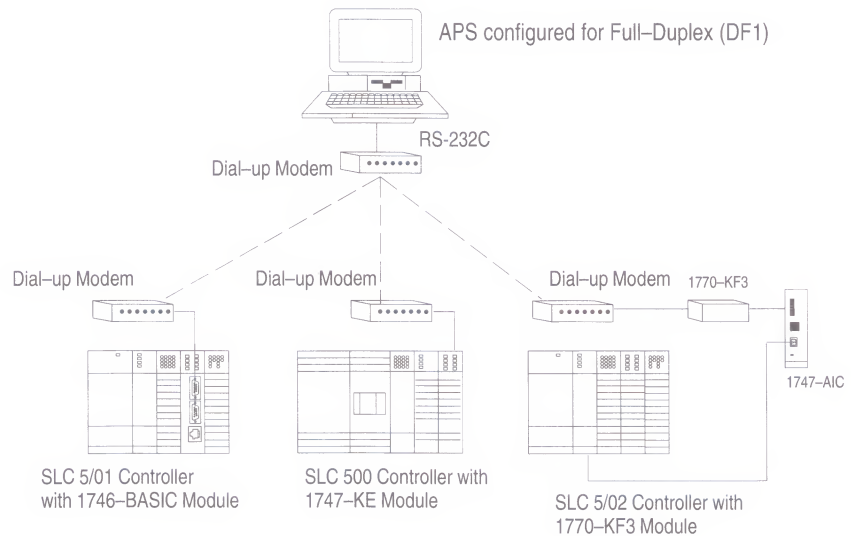
Adjustable frequency AC drives and high performance DC drives provide exceptional reliability in critical motor control applications. They offer process control, energy savings, and communication to I/O devices such as PanelView terminals through the SLC 500 modular controller. For additional information refer to Publication DHQ-6.

Pyramid Solutions Program (PSP)

The Pyramid Solutions Program provides additional third-party products that interface to remote I/O. For additional information refer to Publication PSP-5.1.

Remote Communication

SLC 500 products communicate to serial devices using the following interface products.



Only dial-up modems can be used in the above configuration.

1747-KE DH-485/RS-232C Interface Module

The DH-485/RS-232C Interface module provides a bridge between the DH-485 communication network and RS-232 using Allen-Bradley's DF1 communication protocol. When used in a SLC 500 chassis with a modem, you can:

- remotely program and troubleshoot any single SLC 500 processor
- remotely communicate to a DH-485 network of SLC 500 processors
- remotely collect data directly from the data table of any SLC 500 processor
- use the SLC 500 as a remote terminal unit

1746-BAS BASIC Module and BASIC Development Software

The SLC 500 BASIC module provides two configurable serial channels (RS-232/423, RS-422, and RS-485) and one DH-485 channel, up to 24 Kbytes of battery-backed RAM, plus an additional 32 Kbytes of EEPROM. Using either the 1747-PBASE development software or terminal emulation software, you can use the BASIC module to:

- interface to modems (full- or half-duplex DF1) for transferring data from any SLC 500 processor to other DF1 devices at remote locations
- provide RTU functionality including dial-up and report by exception
- generate and print reports
- perform floating point math functions
- remotely communicate via other protocols using the ProSoft chips

1770-KF3 DH-485 Communication Interface Module

The DH-485 Communication Interface module is a standalone device that provides the same functionality as the 1747-KE interface module. However, when communicating from a remote location to a DH-485 network, the 1770-KF3 does not require a 1747-AIC module.

Remote I/O Functions

The above communication modules connect to most types of dial-up network or direct connect modems. The following modems can be used:

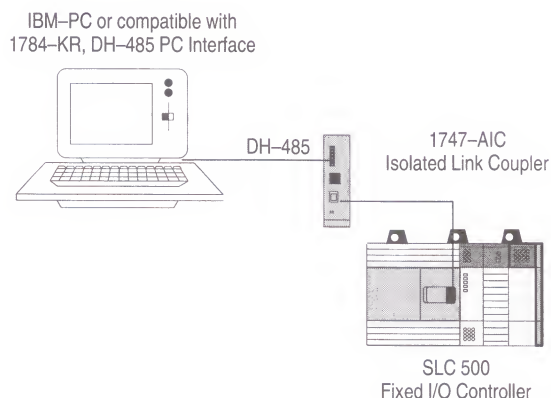
- Manual – typically acoustically coupled modems
- DTE Controlled Answer – attached to phone lines
- Auto Answer – automatically answers and hangs-up the phone
- Direct Connect – connected to a dedicated, leased phone line

The following table shows how serial devices interface with SLC 500 products.

Feature	1770-KF3	1747-KE	1746-BAS
APS functions supported	•	•	•
Module specific programming language	•		•
External power required	•		
Standalone "desktop"	•		
SLC 500 I/O module		•	•
Terminal required for configuration		•	
Descriptive configuration menus		•	
Dial-up modem support			•
Link coupler required for point-to-point communication	•		
Link coupler required for network communication		•	
DH-485 support	•	•	•
DH-485 token passing master	•	•	•
Full-Duplex DF1 support	•	•	•
Half-duplex DF1 slave – local mode	•	•	•
Half-duplex DF1 slave – remote mode	•	•	•
Responds to polls from DF1 half-duplex master	•	•	•
Report by exception capability	•	•	•
ProSoft Protocol Chip support			•

Networking Options

SLC 500 programmable controllers communicate across an embedded DH-485 network for program support and monitoring. The following products provide networking options for the SLC 500 programmable controllers.



1784-KR Personal Computer Interface Card

The Personal Computer Interface Card provides an interface for IBM XT/AT and compatible computers to communicate over the Allen-Bradley DH-485 communication network. This includes communication to the Allen-Bradley line of SLC 500 programmable controllers.

Feature

PC XT/AT Interface to
DH-485

DH-485 isolation

Reduced personal computer
overhead

Benefit

Eliminates the need for the personal
interface converter when using APS.

Eliminates the need for an isolated
link coupler.

Provides a faster update time for the
user interface through the
co-processor.

Specifications

Description	Specification
Power Requirements	5 VDC, 1.8A
Outputs	RS-485 electrical/DH-485 protocol
Hardware Interrupt	IRQ2, IRQ3, IRQ4, IRQ5
Cable Length (max.)	1219 m (4000 ft.)
Environmental conditions	
Operating temperature	0 to +60° C (+32° to +140° F)
Storage temperature	-40° to +85° C (-40° to +185° F)
Humidity rating	5 to 95% (non-condensing)

6001-F2E Standard Driver

The Standard Driver allows the 1784-KR card to be used on the DH-485 communication network for data acquisition applications. This allows you to write 'C' application programs that communicate directly over the DH-485 network to stations such as the SLC 500. Non-token passing slave stations such as the 2755-DM6 Bar Code Reader are also supported.

Feature

Benefit

Provides a Set of Linkable 'C' Function Calls

Establishes communications with devices on the DH-485 network.

Supports Microsoft® 'C' v5.1 and Borland Turbo 'C' v2.0 Compilers

Eliminates the learning curve of new software packages.

Provides application libraries

Aids in data table read or write diagnostic commands.

1747-AIC Isolated Link Coupler for DH-485 Connection

The Isolated Link Coupler provides an electrically isolated network connection for an SLC 500 controller. One coupler is required at each DH-485 network drop. The coupler includes a 304.8 mm (12 in.) cable for connection to the programmable controller. Note that a maximum of 32 devices can be connected to the network.



Programming Options

The following section describes two types of programming options available for the SLC 500. The first is the 1747-PA2E Advanced Programming Software (APS) and the second is the 1747-PT1 Hand-Held Terminal (HHT) that also includes the 1747-PTA1E memory pak.

1747-PA2E Advanced Programming Software

The Advanced Programming Software (APS) v4.01 and later, enables you to program the SLC 500 family processors using the Allen-Bradley T50 Industrial Terminal, T45 and T47 Portable Terminals, or IBM-AT/XT, or compatible personal computer. Included in the APS software is the APS Import/Export Utility (APSIE). This software utility allows you to convert APS archive files and program documentation into ASCII text files and vice versa.

Feature

Full-line processor support

DH-485 and DF1 support

Runtime online editing

Command line entry of instructions and parameters

Online context sensitive help

Benefit

Programs any SLC 500 Fixed processor, SLC 5/01, SLC 5/02, and SLC 5/03 modular processors.

Provides a variety of communication options to meet your application requirements.

Allows entry of programs and data while online in the Run mode when using a SLC 5/03 processor.

Provides time saving keystrokes.

Provides quick access to instructions and status file information.

Feature

System auto configuration

Cut, copy, paste editor

Search and replace

Benefit

Automatically reads system configuration information (including I/O and chassis data), saving you valuable startup time.

Permits ladder logic to be re-used.

Allows quick modification of ladder logic to match unforeseen hardware changes.

System Specifications

Description	Specification
Computer	3.0 Mbyte of hard disk space
Hardware	640Kbyte RAM, minimum 550Kbyte free at execution. Extended or expanded memory recommended, but not required.
Operating System	DOS 3.1 and higher
Printer Interface	parallel or serial 80, 132, or 255 columns

Refer to page 39 for the instruction set.

1747-PIC Interface Converter

The 1747-PIC Interface Converter changes RS-232 signal levels from your personal computer to RS-485 signal levels for the SLC 500 controller. The DH-485 protocol driver is provided by either the 1747-PA2E or 1747-PBASE software.

The converter includes an 279.4 mm (11 in) 25 pin ribbon cable for connection to the computer and a cable (Catalog Number 1746-C10) for connection to the SLC 500 controller.

1747-PT1 Hand-Held Terminal and 1747-PTA1E Programming Memory Pak

The Hand-Held Terminal (HHT) v2.03 is a powerful portable programming platform used to configure the SLC 500 Fixed, SLC 5/01, and the SLC 5/02 processors, enter or modify an application program, monitor the execution of the application program in real-time, or troubleshoot an application program. The HHT accepts programs with a maximum data table size of 6K. Each rung may contain up to 127 instructions. This differs from APS which has a maximum data table size of 16K and each rung can contain 128 instructions.

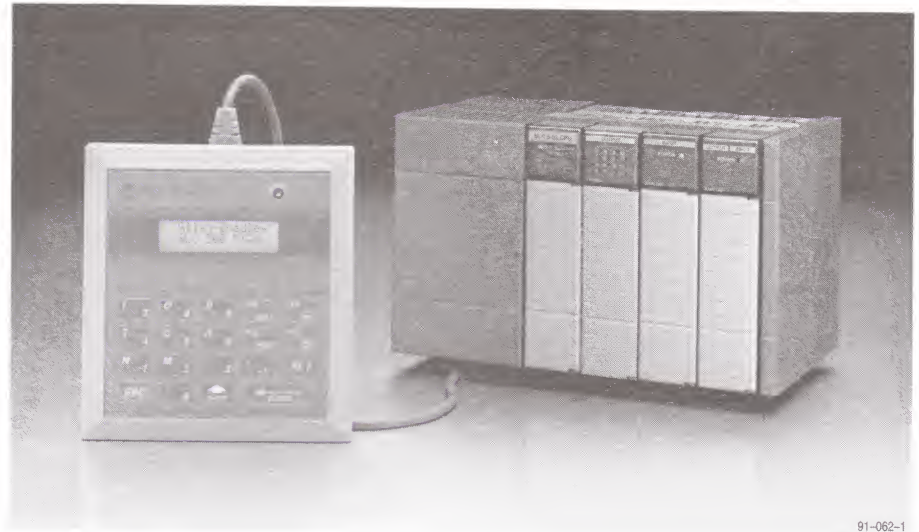
The programming memory pak is interchangeable and available in four languages. When used with the memory pak (v2.03), the HHT can be used to program the SLC 5/02 processor as well as connect to the DH-485 network. Note that the HHT does not support nested branching or conditional output branches.

Feature	Benefit
Rugged construction	Designed for a variety of industrial environments.
Menu-driven firmware	Displays step-by-step directions.
LCD display	Shows up to five rungs of ladder logic at one time.
Network diagnostics	Checks the operation of the DH-485 network (v2.03).
ZOOM function	Displays detailed instruction information.
Formatted display	Displays PID and MSG instructions (v2.03).

Specifications

Description	Specification
Display	8 line x 40 character super-twist nematic LCD
Keyboard	30 keys
Operating Power	0.105A (max.) at 24 VDC
Communication	DH-485
Environmental conditions	
Operating temperature	0 to +40° C (+32° to +104° F)
Storage temperature	-20° to +65° C (-4° to +149° F)
Humidity rating	5 to 95% (non-condensing)
Certification	UL listed, CSA approved

Refer to page 39 for the instruction set.



91-062-1

Operator Interface

Allen-Bradley recognizes the need for efficient interface products. The Data Table Access Module aids in accessing information and monitoring an SLC 500 control system at the plant floor level.

1747-DTAM-E Data Table Access Module

The Data Table Access Module (DTAM) is a plant floor device that allows you to access data file information, change operating modes, monitor and clear processor faults, and transfer memory from or to a EEPROM on any SLC 500, SLC 5/01, SLC 5/02, or SLC 5/03 processor. Multiple DTAMs can be connected to a single processor. Interactive messaging is also supported between the DTAM and the SLC 5/02 or SLC 5/03 processor. The DTAM provides the following features:

Feature	Benefit
DH-485 network compatible	Communicates with up to 31 controllers, one at a time, up to 1219 m (4000 ft.).
Data monitor or modify	Permits data values to be changed in the RUN or PROGRAM mode.
Quick recall macros	Stores frequently used address locations, saving time and simplifying application set-up and modification.
Auto-Attach mode	Automatically initiates communication with the last attached processor after a power cycle, saving costly down time and reducing keystrokes.

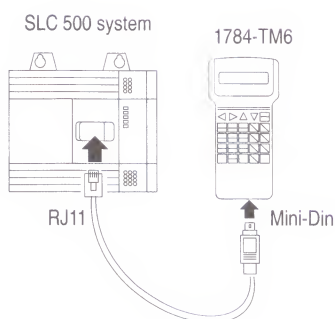
Feature	Benefit
On-Board module configuration	Provides non-volatile EEPROM memory for easy onsite module set up.
Multilingual display	Selectable operator prompting in any of six languages.
Backlit LCD display	Allows for easy viewing in all lighting conditions.
Responds to MSG instructions	Allows interaction between the operator and the ladder program. The SLC 5/02 or SLC 5/03 ladder program directs the dialog.

Specifications

Description	Specification
Display	2 line x 16 character super-twist nematic LCD with LED backlighting
Keyboard	19 keys with tactile feedback
Operating Power	0.104 A (max.) at 24 VDC
Communications	DH-485
Environmental conditions	
Operating temperature	0 to +55° C (+32° to +131° F)
Storage temperature	-20° to +65° C (-4° to +149° F)
Humidity rating	5 to 95% (non-condensing)
Certification	UL listed, CSA approved. Meets NEMA Type 12 and 13 enclosure applications.

Bulletin 2707 DTAM Plus Operator Interface

The DTAM Plus provides a highly functional operator interface to the SLC 500 family of processors. This device features a 4 line x 20 character display window for viewing SLC 500 data table information, operator prompts, and alarm data. The DTAM Plus uses the Allen-Bradley DH-485 network or a point-to-point link using RS-232 or DH-485. Refer to Publication 2707-2.0 for additional information.



1784-TM6 I/O Monitor

The I/O Monitor is a hand-held device that allows you to view and modify data table information in an SLC 500 or PLC-5 programmable controller. You can display one file element, two words, or up to sixteen non-contiguous or contiguous bits. The I/O monitor allows you to search ladder programs for output addresses, change the processor mode, display fault information, and clear minor and major faults. Refer to Publication 1784-6.5.17 for additional information.

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- sales and order support
- product technical training
- warranty support
- support service agreements

Configuring an SLC 500 System

The following section describes:

- How to configure an SLC 500 chassis style system
- How to determine 1746 I/O module compatibility
- Available instructions used with the 1747-PA2E Advanced Programming Software and the 1747-PT1 Hand-Held Terminal
- Fixed controller wiring diagrams
- Dimensions for SLC 500 fixed and modular controllers, and compatible products

SLC 500 Rack Configuration Instructions

This worksheet is intended to help you configure a modular style system. If a fixed I/O controller is more appropriate for your application, refer to page 3 of this System Overview. Each worksheet is designed to help you configure one chassis of I/O. If multiple chassis are necessary for your application, additional chassis should be configured using another worksheet.

1. Estimate the total amount of memory this system requires

- Add up the number of discrete I/O points and place it in (a).
- Add up the number of analog I/O points and place it in (b).
- Add up the number of specialty I/O modules and place it in (c).
- Multiply a, b, and c by the number indicated.
- Total those numbers to give you a memory estimate.

2. Select a processor

Required Memory	Required I/O	Catalog Number
0 to 1K	Less than 256	1747-L511
1K to 4K	Less than 256	1747-L514
1K to 4K	Greater than 256	1747-L524
Greater than 4K	Greater than 256	1747-L532

Place your choice into slot 0 of chassis 1 on the worksheet.

3. Select the I/O

- If multiple chassis system, make copies for each chassis.
- Write in the chassis number.
- Write in the appropriate slot numbers.
- Refer to pages 10 through 12 for discrete I/O selection.
- Refer to pages 13 through 18 for specialty and analog I/O selection.
- Using the worksheet, list each I/O module in the slot you desire.
- List the power consumption of each module in the designated columns. Be sure to account for future expansion.
- When the chassis is complete, add up each power consumption column.

4. Select the correct Power Supply

- Compare the Power Consumption totals with each power supply.
- Choose the smallest power supply that provides sufficient power. Note that the current shown is rated at 55° C.

5. Select the Chassis

- Add up the number of slots used.
- Select the smallest chassis which can hold your I/O. Be sure to account for future expansion.

6. Select the Miscellaneous Devices

To complete your system, include devices such as:

Cables
Communication Interfaces
Operator Interface Devices
Memory Modules

SLC 500 Chassis Configuration Worksheet

1. To estimate your memory requirements, count the number of discrete and analog I/O points, plus the number of specialty I/O.

- | | | | | | |
|-----------------------------------|----------|-------|---|-------|-------------------|
| a. discrete I/O points | a) _____ | x 10 | = | _____ | Instruction Words |
| b. analog input and output points | b) _____ | x 25 | = | _____ | Instruction Words |
| c. specialty I/O points | c) _____ | x 100 | = | _____ | Instruction Words |
| Estimated Total Memory Required | | | | _____ | Instruction Words |

2. Select the Processor

Catalog Number 1747–L511	SLC 5/01	1K Instructions
Catalog Number 1747–L514	SLC 5/01	4K Instructions
Catalog Number 1747–L524	SLC 5/02	4K Instructions
Catalog Number 1747–L532	SLC 5/03	12K Instructions

Power Consumption (Amps) ^①	
5 VDC	24 VDC
0.35	0.105
0.35	0.105
0.35	0.105
0.500	0.175

3. Select I/O

Chassis Number	Catalog Number	Power Consumption		Price
		5V	24V	
Slot				(Slot 0 Reserved for processor in chassis 1)
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
Slot				
		Total Current		

4. Select the Power Supply (shown at 55° C)

Catalog Number 1746-P1	2A	.46A	
Catalog Number 1746-P2	5A	.96A	
Catalog Number 1746-P3	3.6A	.87A	

5. Select the Chassis

Catalog Number 1746-A4	4 slots	_____
Catalog Number 1746-A7	7 slots	_____
Catalog Number 1746-A10	10 slots	_____
Catalog Number 1746-A13	13 slots	_____

6. Select Miscellaneous Devices

Total System Cost

^① Includes power requirements for the DTAM, PIC, and the HHT.

Fixed I/O Chassis Module Compatibility

You can use either of two methods to determine whether the 2-slot, fixed I/O expansion chassis will support a specific combination of modules.

- tabular method
- charting method

The table on the following page represents combinations of modules and indicates whether or not each combination is valid. The chart on page NO TAG represents the region of operating current that the fixed I/O expansion chassis supports.

Important: When referencing either method on the following pages, be aware that there are certain conditions that affect the compatibility characteristics of the BASIC module (**BAS**) and the DH-485/RS-232C module (**KE**).

When you use the BAS module or the KE module to supply power to a 1747-AIC Link Coupler, the Link Coupler draws its power through the module. The higher current drawn by the AIC at 24 VDC is calculated and recorded in the tables for the modules identified as **BASn** (BAS networked) or **KE_n** (KE networked). Make sure to refer to these modules if your application uses the BAS or KE module in this way.

Tabular Method

Using the table on the next page, locate both of the modules you plan to use in the fixed I/O expansion chassis. Follow the top row across until you find one of the modules. Then follow the right column down until you find the other module. The symbol shown in the table cell that marks their intersection gives you information you must know before installing the modules.

- ☐ • A dot indicates a valid combination.
- ☐ No symbol indicates an invalid combination.
- ☐ ▽ A triangle indicates an external 24 VDC power supply may be required. (Refer to the Analog I/O Module User Manual, 1746-NM003.)

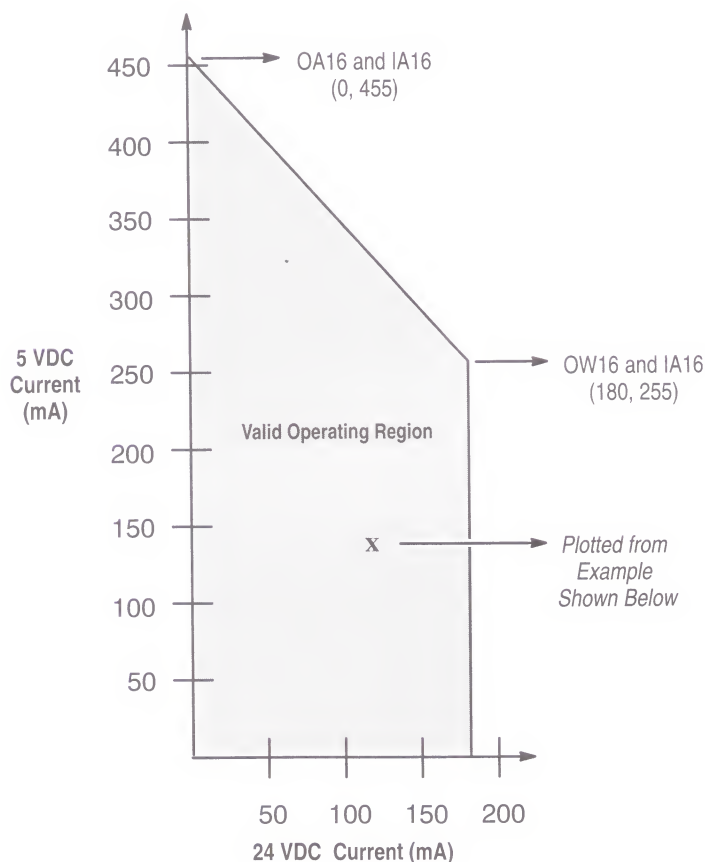
Fixed I/O Chassis – Module Compatibility Table

[illegible]

	5VDC AMPS	24VDC AMPS
IA4	0.035	–
IA8	0.050	–
IA16	0.085	–
IM4	0.035	–
IM8	0.050	–
IM16	0.085	–
OA8	0.185	–
OA16	0.370	–
IB8	0.050	–
IB16	0.085	–
IV8	0.050	–
IV16	0.085	–
IG16	0.140	–
OV8	0.135	–
OV16	0.270	–
OB8	0.135	–
OG16	0.180	–
OW4	0.045	0.045
OW8	0.085	0.090
OW16	0.170	0.180
IO4	0.030	0.025
IO8	0.060	0.045
IO12	0.090	0.070
NI4	0.025	0.085
NIO4I	0.055	0.145
NIO4V	0.055	0.115
DCM	0.360	–
HS	0.300	–
OB16	0.280	–
IN16	0.085	–
BASn	0.150	0.125
BAS	0.150	0.040
OB32	0.452	–
OV32	0.452	–
IV32	0.106	–
IB32	0.106	–
OX8	0.085	0.090
NO4I	0.055	0.195
NO4V	0.055	0.145
ITB16	0.085	–
ITV16	0.085	–
KE	0.150	0.040
KE _n	0.150	0.145
OBP16	0.250	–
NT4	0.060	0.020

Charting Method

The following chart depicts the range of current combinations supported by the fixed I/O expansion chassis. To use it, you must first determine the backplane current draw and operating voltage for both of the modules you plan to use in the chassis. You can get these specifications from the table alongside the chart. Next, plot each of the currents on the chart below. If the point of intersection falls within the operating region, your combination is valid. If not, your combination cannot be used in a 2-slot, fixed I/O chassis.



Example: Plot IN16 and NIO4V

IN16 = 0.085A at 5 VDC

NIO4V = 0.055A at 5 VDC and 0.115A at 24 VDC

1. Add current draws of both modules at 5 VDC to get 0.14A (140mA).
2. Plot this point on the chart above (140mA at 5 VDC).
3. Plot current draw at 24 VDC (115mA at 24 VDC).
4. Note the point of intersection on the chart above (marked x). This combination falls within the valid operating region for your fixed I/O chassis.

Important: The NO4I and NO4V analog output modules may require an external power supply. Refer to the analog user manual.

Instruction Set

Use the following instructions with the 1747-PA2E Advanced Programming Software (APS) or the 1747-PT1 Hand-Held Terminal (HHT).

Bit Instructions

Examine If Closed
Examine If Open
One Shot Rising
Output Energize
Output Latch
Output Unlatch

Timer and Counter Instructions

Timer On/Timer Off –Delay
Retentive On–Delay Timer
Count Up/Count Down
High-Speed Counter
Reset

I/O and Interrupt Instructions

Immediate Input/Output With Mask
I/O Interrupt Enable/Disable^①
Reset Pending I/O Interrupt^①
I/O Refresh^①
Selectable Timed Interrupt Enable/Disable^①
Selectable Timed Interrupt Start^①
Interrupt Subroutine^①

Comparison Instructions

Equal
Not Equal
Less Than
Greater Than
Less Than or Equal
Greater Than or Equal
Masked Comparison for Equal
Limit Test^①

Move and Logical Instructions

Move
Masked Move
And
Or
Exclusive Or
Not

I/O Message Instructions

Service Communications^①
Message^①

Math Instructions

Add/Subtract
Multiply/Divide
Double Divide
Clear
Negate
Decode
Square Root^①
Scale^①

Control Instructions

Label
Jump
Jump to Subroutine
Return from Subroutine
Master Control Reset
Temporary End
Suspend
Subroutine

Sequencer Instructions

Sequencer Output
Sequencer Compare
Sequencer Load^①

Bit Shift, FIFO, and LIFO Instructions

Bit Shift Right/Left
Load/Unload, First In First Out^①
Load/Unload Last In First Out^①

File Instructions

Copy File
Fill File

Special Instruction

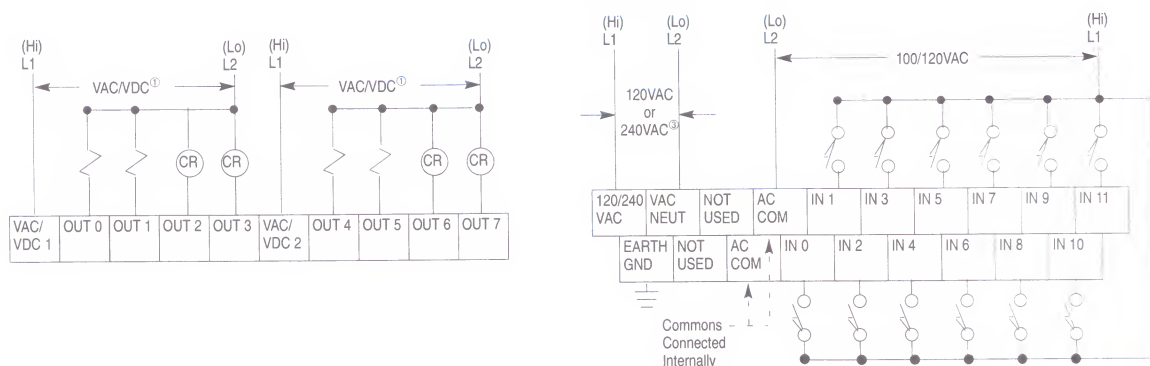
Proportional, Integral, Derivative^①

^① Does not apply to the SLC 5/01 processor (Catalog Number 1747-L511 or 1747-L514) or the SLC 500 Fixed processor.

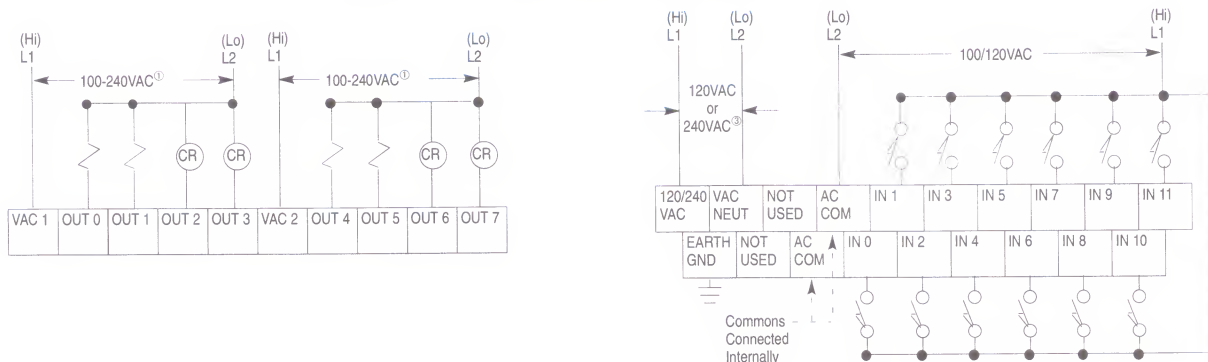
Fixed Wiring Diagrams

For detailed wiring diagram information for the fixed controller, refer to the *Installation & Operation Manual for Fixed Hardware Style Programmable Controllers*, Catalog Number 1747-800.

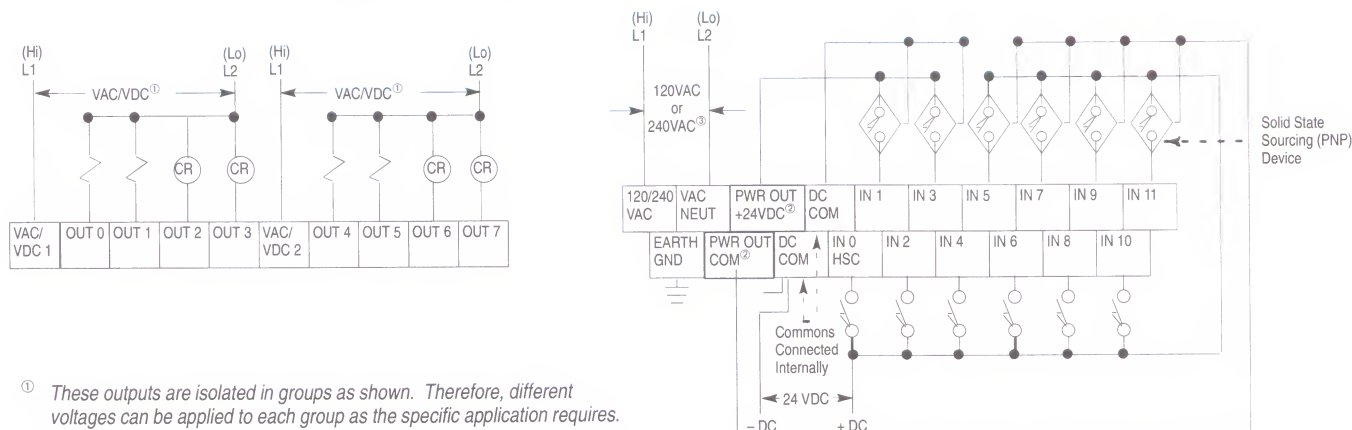
CATALOG NUMBER 1747-L20A (12) 120 VAC Inputs & (8) Relay Outputs



CATALOG NUMBER 1747-L20B (12) 120 VAC Inputs & (8) Triac Outputs



CATALOG NUMBER 1747-L20C (12) 24 DC Volt Sinking Input Circuitry, High-Speed Counter Input & (8) Relay Outputs

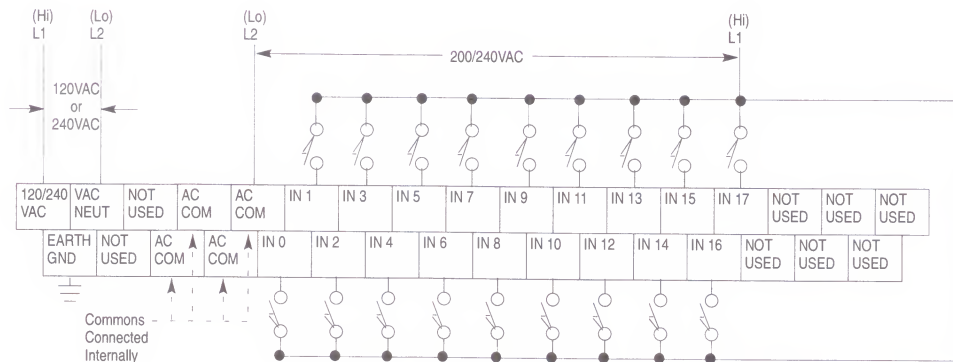
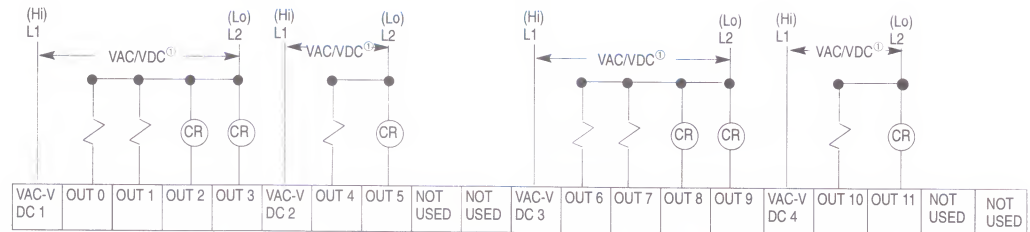


^① These outputs are isolated in groups as shown. Therefore, different voltages can be applied to each group as the specific application requires.

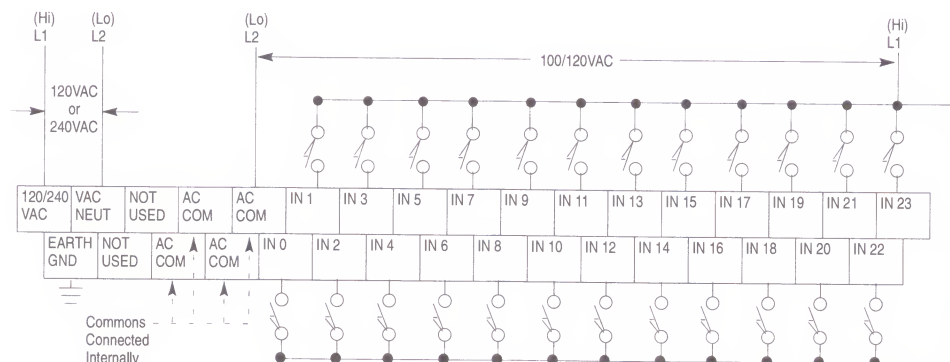
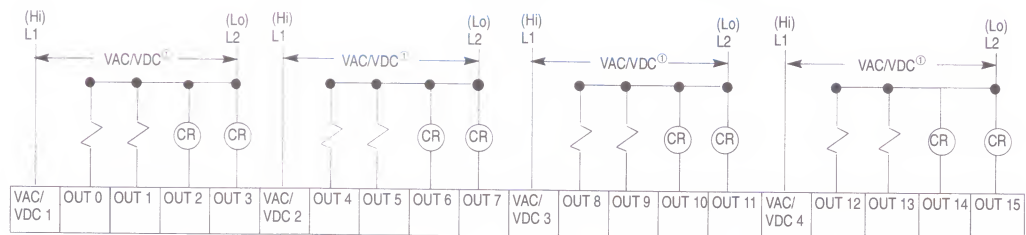
^② 24 VDC, 200mA user power is available for sensors.

^③ 120 or 240 volt operation is automatically selected by the SLC processor.

CATALOG NUMBER 1747-L30A
(18) 240 Volt AC Inputs & (12) Relay Outputs



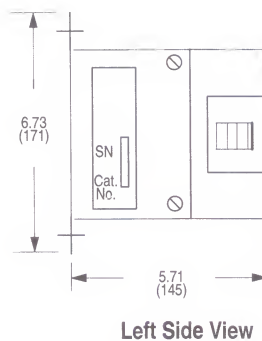
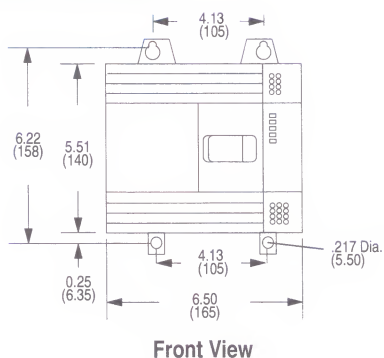
CATALOG NUMBER 1747-L40A
(24) 120 Volt AC Inputs & (16) Relay Outputs



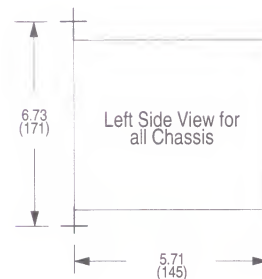
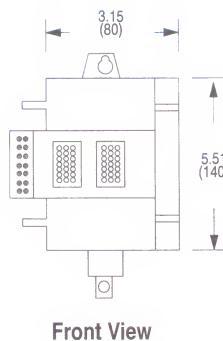
① These outputs are isolated in groups as shown. Therefore, different voltages can be applied to each group as the specific application requires.

Approximate Chassis Dimensions inches (millimeters)

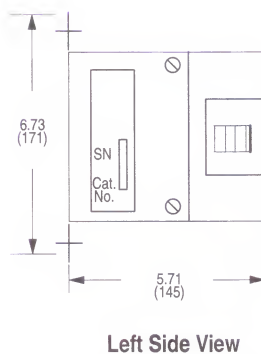
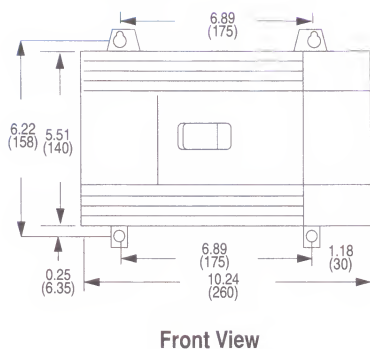
20 I/O Fixed Controller



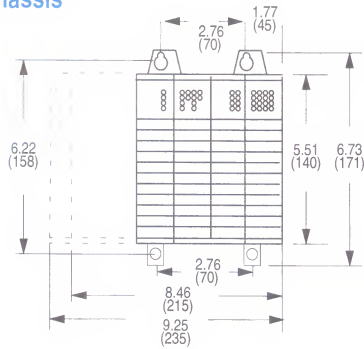
2-Slot Expansion Chassis



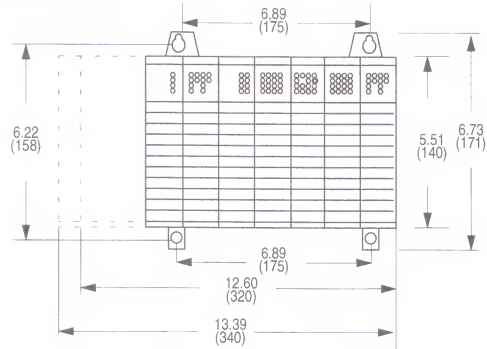
30 & 40 Fixed Controller



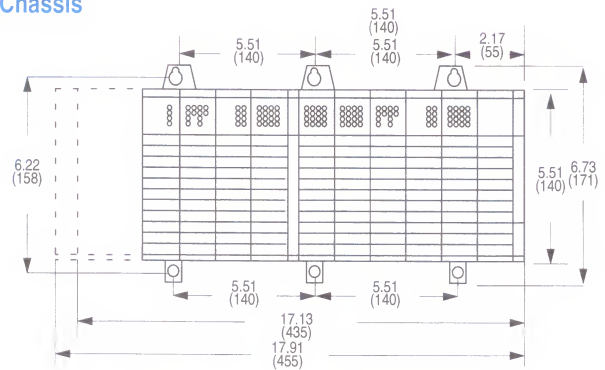
4-Slot Chassis



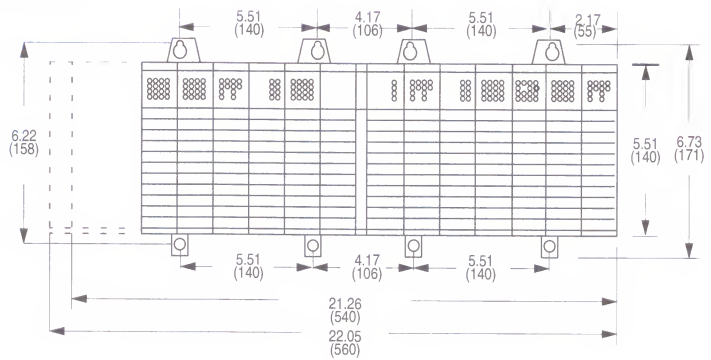
7-Slot Chassis



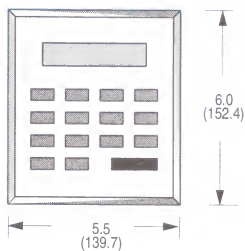
10-Slot Chassis



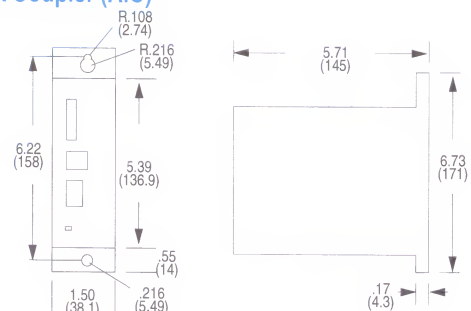
13-Slot Chassis



Data Table Access Module



Isolated Link Coupler (AIC)



Available Cables

Use the following table to help you select the appropriate cable for your application.

For Connectivity Between These Devices		This is the Preferred Cable	These Cables May Be Used
1746-A4, -A7, -A10, or -A13 Chassis	1746-A4, -A7, -A10, or -A13 Chassis	1746-C7 1746-C9	-
1747-PIC Personal Interface Converter 1747-PT1 Hand-Held Programming Terminal 1747-DTAM-E Data Table Access Module 2707-Lxxx, -Vxxx DTAM Plus	1747-AIC Isolated Link Coupler SLC 500 Processors (DH-485 Channel)	1747-C10	1747-C11 1747-C20
1747-AIC Isolated Link Coupler	SLC 500 Processors (DH-485 Channel)	1747-C11	1747-C10 1747-C13 1747-C20
1747-KE DH-485/RS-232C Interface Module 1746-BAS BASIC Module	1747-AIC Isolated Link Coupler	1747-C13	1747-C11
1746-xx32 32-Point I/O Modules	1492-IFM40x	1492-CABLExH	-
1747-L532 Processor (RS-232 Channel 0)	Personal Computer Serial Port (9-Pin DTE)	1747-CP3	-
1747-DSN Distributed I/O Scanner	1791-IOBA, -IOBB Block I/O (Series A only)	Belden 9463	-
1747-SN Remote I/O Scanner 1747-DCM Direct Communications Module 1747-ASB SLC Remote I/O Adapter Module	Remote I/O Network	Belden 9463	-
1747-AIC Isolated Link Coupler 1770-KF3 DH-485 Communication Interface 1784-KR Personal Computer Interface	1747-AIC Isolated Link Coupler	Belden 9842	-

Publications

For more information on the SLC 500 products discussed in this overview, refer to the following publications. Refer to Publication SD499, Automation Group Publication Index for the most current release.

Product	Publication
High-Speed Counter Module	1746-2.32
BASIC Module and BASIC Development Software	1746-2.33
Analog I/O Modules	1746-2.34
Discrete I/O Modules	1746-2.35
Thermocouple/mV Input Module (NT4)	1746-2.36
Bulletin 1746-1747 Price Sheet	1746-3.0
Direct Communications Module	1747-2.33
Remote I/O Scanner Module (SN)	1747-2.34
Distributed I/O Scanner Module (DSN)	1747-2.35
SLC 500 Class I, Division 2 Certification	1747-2.36
DH-485/RS-232-C Interface Module (KE)	1747-2.37
Remote I/O Adapter Module (ASB)	1747-2.38
SLC 500 Chassis-based Processors	1747-2.39

For more information on the non-SLC products discussed in this overview, refer to the following publications.

Product	Publication
Interface Modules and Cables	1492-1.6
I/O Monitor	1784-6.5.17
1791 Block I/O	1791-1.3
DTAM Plus Operator Interface	2702-2.0
RediPANEL Operator Modules	2705-1.0
Dataliner Message Displays	2706-1.0
PanelView Operator Terminals	2711-1.1
Drives	DHQ-6
Pyramid Solutions Program	PSP-5.1

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